

# **Manufacturing (Double Award)**

General Certificate of Secondary Education **J505**

General Certificate of Secondary Education(Double Award) **J510**

## **Mark Schemes for the Units**

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**January 2010**

**J505/J510//MS/R/10J**

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### **MARK SCHEME FOR THE UNITS**

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# B232B-02 Manufacturing Processes

| Question Number         |                               | Syllabus Ref   | Expected Answer   | Mark    | Rationale |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
|-------------------------|-------------------------------|--|---|---------|-----------|----------|-----------|----------------|-------------------------------|-------------------------|----------------|-------------|-----------------------|----------------|-----------|------|-----------------------------|-------------|-------------------------|---|---|
| 1                       | (a)                           | A  | <table border="1"> <thead> <tr> <th>Product</th> <th>Sector</th> </tr> </thead> <tbody> <tr> <td>Armchair</td> <td>Furniture</td> </tr> <tr> <td>Computer mouse</td> <td>Electronic and communications</td> </tr> <tr> <td>Freeze-dried vegetables</td> <td>Food and drink</td> </tr> <tr> <td>Denim jeans</td> <td>Clothing and textiles</td> </tr> <tr> <td>Perfume bottle</td> <td>Packaging</td> </tr> <tr> <td>Soap</td> <td>Chemical and pharmaceutical</td> </tr> <tr> <td>Wheelbarrow</td> <td>Machinery and equipment</td> </tr> </tbody> </table> | Product | Sector    | Armchair | Furniture | Computer mouse | Electronic and communications | Freeze-dried vegetables | Food and drink | Denim jeans | Clothing and textiles | Perfume bottle | Packaging | Soap | Chemical and pharmaceutical | Wheelbarrow | Machinery and equipment | 7 | Products shown as in spec. Accept others where appropriate.<br>Incorrect sector name – no credit for product. |
|                         | Product                       | Sector   |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| Armchair                | Furniture                     |  |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| Computer mouse          | Electronic and communications |  |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| Freeze-dried vegetables | Food and drink                |  |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| Denim jeans             | Clothing and textiles         |  |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| Perfume bottle          | Packaging                     |  |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| Soap                    | Chemical and pharmaceutical   |  |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| Wheelbarrow             | Machinery and equipment       |  |   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |
| (b)                     | A                             | <p>One mark for each of two from: Electrical, motor manufacturing, Paper and print.<br/>One mark for each of two products from the stated sector.<br/>Electrical – torch, electric Kettle, alarm clock<br/>motor manufacturing – caravan body, car door, wheels<br/>Paper and print – magazine, pop-up book, gift card</p> | 2 + 2   |         |           |          |           |                |                               |                         |                |             |                       |                |           |      |                             |             |                         |   |   |

| Question Number |     | Syllabus Ref | Expected Answer   | Mark | Rationale  |
|-----------------|-----|--------------|---|------|--|
| 2               | (a) | B            | <p>Two marks for each method described (what the method is and how it is carried out):</p> <p>Eg visual check for injection mould marks<br/> Emailed company asking ..<br/> Watched video showing....<br/> Had a visiting speaker who said.....</p>   | 4    | <p>Must state method AND detail how OR what found out<br/> 'looked on internet' no marks<br/> 'Used manufacturers website' 1 mark 'notes for schools' second mark.</p> |
| 2               | (b) | E            | <p>Three marks for a clear explanation why research into existing products is carried out when designing. For example stating a point, relevance and example.</p> <p>Identifying strengths and weaknesses(1) of product designs so designer can retain former(1) and focus on improvement of latter(1)<br/> Identifying materials used (1) and their relevant properties (1) .....</p> <p>Establishing market prices/quality/value gives designer a view on what the market will stand.</p> | 3    | <p>For 3 marks should be reasoned.<br/> MUST relate to <b>design</b> process</p>   |
| 3               | (a) | F            | <p>1 mark for each of 4 items correctly placed (emboldened below)</p> <p><b>Production planning</b><br/> Material supply and control(answer given)</p> <p><b>Processing and production</b><br/> Assembly (answer given)</p> <p><b>Final quality check</b><br/> Packaging(answer given)</p> <p><b>Despatch</b></p>   | 4    |  |

| Question Number |      | Syllabus Ref | Expected Answer  | Mark | Rationale  |
|-----------------|------|--------------|--|------|--|
| (b)             | (i)  | F            | <p>2 marks for describing an activity carried out in processing and production</p> <p>For example: tablets are coated in a rotary coating drum/ with lactose powder</p> <p>Potato slices are pre boiled in salted water</p> <p>Side panels are spot welded robotically</p> <p>Legs are bent to shape on a former</p> <p>Axial components are inserted into the pcb automatically</p> <p>Capsules are inserted and stuck inside the cap</p>   | 2    | <p>For two marks there must be expansion or detail given.</p> <p>Potatoes are boiled – 1</p> <p>Tablet coating – 1</p> |
|                 | (ii) | F            | <p>2 marks for describing an activity carried out in packaging, for example:</p> <p>Portions are dispensed/squeezed/squirted into foil containers then lids are crimped on.</p> <p>Tablets cartons and foiled laminate are fed into the blister packaging machine which packs and date stamps.</p> <p>Products are placed into preformed expanded polystyrene /instruction books are added/ placed on cardboard cartons.</p> <p>Placed on hangers on rails then shrink wrapped for transport</p> |      | 2  |

| Question Number |         | Syllabus Ref | Expected Answer  | Mark | Rationale                                 |
|-----------------|---------|--------------|--|------|---|
| 4               | (a)     | E            | <p>One mark for each of two factors that influence the form in which a material is supplied.<br/>For example:<br/>What it is going to be used for/ the process it is used in, or similar<br/>Material manufacturing constraints<br/>Transport constraints<br/>Economic factors<br/>Customer preferences<br/>Industry standards</p> | 2    | List is not exhaustive                    |
|                 | (b) (i) | C            | <p>Name one material that is usually supplied in granular form.<br/><br/>One mark for a material supplied as granules.<br/>For example: freeze dried milk/coffee, nylon, polystyrene, pvc</p>  | 1    | List is not exhaustive                    |
|                 | (ii)    | C            | <p>Name one product made from the material you have given in (a) above.<br/><br/>One mark for a product made from the stated material<br/>For example: rich breads, coffee drink, nut inserts, moulded parts,</p>  | 1    | Must relate to the material given in (i). |

| Question Number |            | Syllabus Ref | Expected Answer  | Mark     | Rationale                            |
|-----------------|------------|--------------|--|----------|--------------------------------------|
|                 | (iii)      | <b>E</b>     | <p>Give one benefit to a manufacturer of using granular materials.</p> <p>Two marks for giving a benefit to the manufacturer. For example:<br/>           Granular materials flow (1) which makes automatic handling/fitting existing equipment/feeding easier(1)<br/>           Quantities can be measured accurately (1) reducing waste (1).</p>   | <b>2</b> | Second mark for detail or expansion. |
| <b>5</b>        | <b>(a)</b> | <b>C/D</b>   | <p>Two marks for clear description relating an appropriate Information, communication or digital technology to <u>design products for manufacture</u>. For example<br/>           Presentation package to show design ideas to client<br/>           Spreadsheet to calculate loadings/costs/total weight<br/>           Word processor to write for details of.....<br/>           Email to write for.../ to attach CAD files /etc to send to....</p> | <b>2</b> |                                      |
|                 |            | <b>C/D</b>   | <p>Two marks for clear description relating an appropriate Information, communication or digital technology to evaluate product designs. For example<br/>           Mobile phone to check with site surveyors.<br/>           Modelling using CAD/croc clips, computerised testing</p>   | <b>2</b> |                                      |



| Question Number |  | Syllabus Ref | Expected Answer   | Mark     | Rationale   |
|-----------------|--|--------------|---|----------|---|
| (b)             |  | <b>D</b>     | Two marks for clear description relating an appropriate Information, communication or digital technology to ensure safety when manufacturing a product:<br>Machine cut outs to ensure safe working<br>Emission tests carried out on all products<br>Bacteriological tests on samples from each batch<br>Computer selects a random sample and runs electrical tests on them. | <b>2</b> | Accept related to safety of product or production workers, but amplification needed for second mark |
|                 |  | <b>D</b>     | Two marks for each of two benefits relating to IT in production planning. For example:<br>JIT production becomes practicable because can calculate/predict accurately when resources will be needed<br>Similar for workforce planning<br>IT monitoring of production to adapt plans as progress (if reject rate increases or decreases then resource needs changed)         | <b>4</b> |   |
| <b>6</b>        |  | <b>B</b>     | Two marks for clear description of a health consideration for the working environment.<br>Consider how to reduce exposure to harmful dusts/vapours/irritants<br>Monitoring of environment<br>Instructions for lifting safely or consider how to avoid heavy manual work.<br>Workers must wear a radiation monitor at all times.   | <b>2</b> | Accept consideration or precaution  |

| Question Number |            | Syllabus Ref | Expected Answer  | Mark     | Rationale  |
|-----------------|------------|--------------|--|----------|--|
|                 |            | <b>B</b>     | Two marks for clear description of a safety consideration for the working environment.<br>Ensure good housekeeping to prevent trips/slips<br>Mark out hazardous areas.<br>Provision of ppe<br>Checking that guards are in place and working properly (have not been tampered with)   | <b>2</b> | Accept consideration or precaution   |
|                 |            | <b>B</b>     | Two marks for clear description of a hygiene consideration for the working environment. For example<br>There must be adequate facilities for workers to wash/change before eating/after shifts.<br>Antibacterial gel/wipes provided<br>Swabs must be taken hourly to check for bacterial contamination                               | <b>2</b> | Accept consideration or precaution   |
| <b>7</b>        | <b>(a)</b> | <b>C</b>     | 1 mark for C   | <b>1</b> | Check question to ensure candidate understands<br>10 – excellent, 1 – poor.  |
|                 | <b>(b)</b> | <b>F</b>     | Two marks for explanation showing understanding of JIT production.<br>Because in JIT production, materials arrive as they are needed (1). F is not readily available (1) the fact that it is easy to store is not relevant for JIT (1). Other materials score as highly as F on value for money (1) which is its other good feature. | <b>2</b> | Note if response of D given in a may get a response showing understanding of JIT (give credit) with incorrect statements (ignore). |

| Question Number |     | Syllabus Ref | Expected Answer  | Mark | Rationale |
|-----------------|-----|--------------|--|------|-----------|
|                 | (c) | C            | 3 marks for clear explanation, with reasoning, giving points such as:<br>reject any that is poor in any category; add up all the scores; easy to store (1) relating this to a lack of availability (1) reference to reliance production requirements (1) material properties make it necessary despite cost ease of use, safeworking factory being poor (1)  | 3    |           |
| 8               | (a) | F            | Three marks for a clear explanation, (guidance: why, how, example).<br>Easier/faster to work(1) than...(1)<br>Prototype for aesthetics/ergonomics only (1)(eg stereo lithography)<br>Cheaper/lighter(1) than...(1)<br>Easier to modify(1) than (1)<br>Can be re-used (1). (such as (1) wax machining, expanded polystyrene cake form for decorating)   | 3    |           |
| *8              | (b) | F            | Six marks for a detailed explanation why manufacturing methods used in product development are often modified when a product goes into full scale production.<br><br>Examples of relevant points:<br><br>Manual processes are often replaced by semi or fully automated processes. Full scale production may use different materials/ forms of material which require different equipment/ tools for processing. |      |           |

| Question Number | Syllabus Ref | Expected Answer  | Mark | Rationale |
|-----------------|--------------|--|------|-----------|
|                 |              | <p><b>QWC</b></p> <p>Level 1 (0-2 marks)<br/>Basic discussion showing some understanding of the impact of systems and control technology on production. Will be little, or no, use of specialist terms. Answers may be ambiguous or disorganised. Errors of spelling, punctuation and grammar may be intrusive.</p> <p>Level 2 (3-4 marks)<br/>Adequate discussion showing an understanding of the impact of systems and control technology on production. There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, punctuation and grammar.</p> <p>Level 3 (5-6 marks)<br/>Thorough analysis, showing a clear understanding of the impact of systems and control technology on production.. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.</p> | 6    |           |
|                 |              | <b>Paper total 60</b>  |      |           |

## B234B-02 Impact of modern technologies on manufacturing

| Question Number | Syllabus Ref | Expected Answer   | Mark | Rationale |
|-----------------|--------------|---|------|-----------|
| 1 (a)           | A            | <p>1 mark for each correct link shown:</p> <p>Chemical and Pharmaceutical – Petroleum Jelly<br/>           Clothing and textiles – Sails<br/>           Electrical and communications – Sat-nav system<br/>           Food and drink – Pro-biotic yogurt<br/>           Furniture – Outdoor seat<br/>           Machinery and Equipment – Pressure washer<br/>           Motor manufacturing – Seat belts<br/>           Paper and print – Wallpaper</p>  | [8]  |           |
| 1 (b)           | F            | <p>One mark for each correct standardised component appropriate to the sector shown.</p> <p>examples below</p> <p>Labels, buttons, , ,generic components from most sectors<br/>           Chemical and Pharmaceutical Child resistant containers<br/>           Clothing and textiles Zip fasteners<br/>           Electrical and Communications 3 pin plug, resistors,<br/>           Food and drink Hundreds and thousands, breadcrumbs,<br/>           Furniture Castors wood screws<br/>           Machinery and Equipment Nuts and bolts washers<br/>           Electronic and communications LEDs transistors,<br/>           Paper and print – A4 card<br/>           Motor manufacturing – bolts, screws, bulbs, LEDs</p> | [4]  |           |

| Question Number     | Syllabus Ref                            | Expected Answer   | Mark    | Rationale |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
|---------------------|---|---|---------|-----------|---------|-------------------|-----------------------------|-----------------------------------|-----------------|----------------------------|-------------------------------|-------|------------------|------------------|----------------|-----|--------------------------------|-----------------|---------------------------|------------------------------------|---------------------|---|---|--------------|------------|---------------|-----------|-----------|-----------------------|----------------|------------------------|----------------|---------------|-------------------------|-----------------------|-----|--|
| 2 (a)               | I                                       | <p>No marks for selection<br/>           One mark for material used in the selected product<br/>           One mark for a benefit of the stated material</p> <table border="1"> <thead> <tr> <th>Product</th> <th>Material</th> <th>Benefit</th> </tr> </thead> <tbody> <tr> <td>Pro-biotic yogurt</td> <td>Enzymes, laminated foil lid</td> <td>Healthy product ensures freshness</td> </tr> <tr> <td>Petroleum Jelly</td> <td>Mineral oil paraffin/waxes</td> <td>Desired texture/melting point</td> </tr> <tr> <td>Sails</td> <td>Cotton/polyester</td> <td>Strong/rot proof</td> </tr> <tr> <td>Sat-nav system</td> <td>LCD</td> <td>Thin screen takes up less room</td> </tr> <tr> <td>Pressure washer</td> <td>Injection moulded polymer</td> <td>Precision made for better assembly</td> </tr> <tr> <td>Orange juice carton</td> <td>Laminated card/foil/polyethylene Rekart</td> <td>Waterproof, strong, tearable<br/>FSC certified easy to crush, lightweight.</td> </tr> <tr> <td>Outdoor seat</td> <td>Cedar wood</td> <td>Resists water</td> </tr> <tr> <td>Wallpaper</td> <td>fungicide</td> <td>Prevents mould growth</td> </tr> <tr> <td>Car windscreen</td> <td>Laminated safety glass</td> <td>Safe in impact</td> </tr> <tr> <td>Electric fire</td> <td>Chromed/stainless steel</td> <td>Strong and attractive</td> </tr> </tbody> </table> | Product | Material  | Benefit | Pro-biotic yogurt | Enzymes, laminated foil lid | Healthy product ensures freshness | Petroleum Jelly | Mineral oil paraffin/waxes | Desired texture/melting point | Sails | Cotton/polyester | Strong/rot proof | Sat-nav system | LCD | Thin screen takes up less room | Pressure washer | Injection moulded polymer | Precision made for better assembly | Orange juice carton | Laminated card/foil/polyethylene Rekart | Waterproof, strong, tearable<br>FSC certified easy to crush, lightweight. | Outdoor seat | Cedar wood | Resists water | Wallpaper | fungicide | Prevents mould growth | Car windscreen | Laminated safety glass | Safe in impact | Electric fire | Chromed/stainless steel | Strong and attractive | [4] |  |
| Product             | Material                                | Benefit   |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Pro-biotic yogurt   | Enzymes, laminated foil lid             | Healthy product ensures freshness   |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Petroleum Jelly     | Mineral oil paraffin/waxes              | Desired texture/melting point   |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Sails               | Cotton/polyester                        | Strong/rot proof  |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Sat-nav system      | LCD                                     | Thin screen takes up less room  |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Pressure washer     | Injection moulded polymer               | Precision made for better assembly  |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Orange juice carton | Laminated card/foil/polyethylene Rekart | Waterproof, strong, tearable<br>FSC certified easy to crush, lightweight.   |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Outdoor seat        | Cedar wood                              | Resists water   |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Wallpaper           | fungicide                               | Prevents mould growth   |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Car windscreen      | Laminated safety glass                  | Safe in impact  |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |
| Electric fire       | Chromed/stainless steel                 | Strong and attractive   |         |           |         |                   |                             |                                   |                 |                            |                               |       |                  |                  |                |     |                                |                 |                           |                                    |                     |   |   |              |            |               |           |           |                       |                |                        |                |               |                         |                       |     |  |

| Question Number     | Syllabus Ref  | Expected Answer  | Mark    | Rationale          |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
|---------------------|---|--|---------|--------------------|-------------------|---|-----------------|--|-------|---|----------------|---|-----------------|---|---------------------|---|--------------|------------------------------------|-----------|--|----------------|---------------------------------|---------------|--------------------------|-----|----------------|
| 2 (b)               | G   | <p>Three marks for a clear explanation including for example:<br/>An appropriate example of technology (1) and a description of its use (1) in manufacturing the product (1). Examples below</p> <table border="1"> <thead> <tr> <th>Product</th> <th>Technology and use</th> </tr> </thead> <tbody> <tr> <td>Pro-biotic yogurt</td> <td>Temperature controlled culture vats to ensure quality</td> </tr> <tr> <td>Petroleum Jelly</td> <td>Electronic dispensers to ensure exact amount put into each jar</td> </tr> <tr> <td>Sails</td> <td>Floor inset sewing machine to fix pieces together</td> </tr> <tr> <td>Sat-nav system</td> <td>Surface mount technology to fix components to PCB</td> </tr> <tr> <td>Pressure washer</td> <td>Injection moulding of small intricate components for accuracy and consistency</td> </tr> <tr> <td>Orange juice carton</td> <td>Flexopress/offset lithography printing<br/>Extrusion laminating of foil and polymers with printed card..</td> </tr> <tr> <td>Outdoor seat</td> <td>Injection moulding, spray coating,</td> </tr> <tr> <td>Wallpaper</td> <td>Paper thickness monitoring system<br/>Spray coating of adhesive layer</td> </tr> <tr> <td>Car windscreen</td> <td>Temp controlled Tempering ovens</td> </tr> <tr> <td>Electric fire</td> <td>Computer safety testing,</td> </tr> </tbody> </table> | Product | Technology and use | Pro-biotic yogurt | Temperature controlled culture vats to ensure quality | Petroleum Jelly | Electronic dispensers to ensure exact amount put into each jar | Sails | Floor inset sewing machine to fix pieces together | Sat-nav system | Surface mount technology to fix components to PCB | Pressure washer | Injection moulding of small intricate components for accuracy and consistency | Orange juice carton | Flexopress/offset lithography printing<br>Extrusion laminating of foil and polymers with printed card.. | Outdoor seat | Injection moulding, spray coating, | Wallpaper | Paper thickness monitoring system<br>Spray coating of adhesive layer | Car windscreen | Temp controlled Tempering ovens | Electric fire | Computer safety testing, | [3] | Not exhaustive |
| Product             | Technology and use  |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Pro-biotic yogurt   | Temperature controlled culture vats to ensure quality   |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Petroleum Jelly     | Electronic dispensers to ensure exact amount put into each jar  |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Sails               | Floor inset sewing machine to fix pieces together   |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Sat-nav system      | Surface mount technology to fix components to PCB   |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Pressure washer     | Injection moulding of small intricate components for accuracy and consistency                           |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Orange juice carton | Flexopress/offset lithography printing<br>Extrusion laminating of foil and polymers with printed card.. |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Outdoor seat        | Injection moulding, spray coating,  |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Wallpaper           | Paper thickness monitoring system<br>Spray coating of adhesive layer                                    |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Car windscreen      | Temp controlled Tempering ovens   |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |
| Electric fire       | Computer safety testing,  |  |         |                    |                   |   |                 |  |       |   |                |   |                 |   |                     |   |              |                                    |           |  |                |                                 |               |                          |     |                |

| Question Number | Syllabus Ref | Expected Answer   | Mark | Rationale   |
|-----------------|--------------|---|------|---|
| 3 (a)           | C            | <p>One mark for an example of a recyclable material and a further two marks for why it is recycled. ie environmental, economic reasoning.<br/>For example, materials:<br/>lipstick/ice cream misshapes reformed to make product powder from tableting (can be re-pressed on site)</p> <p><u>Clothing and textiles</u><br/>small offcuts sold on to be felted/as rags to recover costs<br/>materials at end of runs – sold on to be cut into patchwork pieces</p> <p><u>Food and drink</u><br/>fat trimmed from pork – rendered to lard<br/>mis shapen choc ices – incorporated into chocolate ice cream</p> <p><u>Furniture</u><br/>wood offcuts used for joints/packaging<br/>Packaging<br/>offcuts from platens sent for reprocessing/ recycled</p> | [3]  | <p>Second mark must include amplification<br/>Does not need to be a 'pure' material (as shown).</p> |
| 3 (b)           | C            | <p>Three marks for a clear explanation why materials are not always recycled.<br/>Cost of recycling more than disposal/worth of recycled materials<br/>Contamination from manufacturing process/product life makes unsafe</p>   | [3]  | <p>For 3 marks, needs to be 'joined up' ie because..</p>  |



| Question Number | Syllabus Ref | Expected Answer   | Mark | Rationale   |
|-----------------|--------------|---|------|---|
| 4               | H            | <p>3 marks for each clear explanation how modern technology has brought about the benefit.</p> <p>Improved health and safety of workers:<br/>           More hazardous jobs are carried out mechanically which means workers are not at risk of injury. Safety guards, tell tales, radiation monitors and other safety measures help avoid injury/ prevent illness. Modern technology has enables heath screening programmes for workers, and companies may offer benefits such as fitness suites and flu jabs.</p> <p>Improved lifestyle of workers:<br/>           Manufactured goods are available at affordable prices, within the range of workers who are also better paid because they are skilled operators rather than mainly manual labourers.</p> <p>More hazardous jobs are carried out mechanically which means workers are not at risk daily, reducing stress. Also dirty jobs – so workers don't need to get cleaned up/changed before leisure time.</p> <p>Changes to shift patterns:<br/>           Because automated monitoring and control of production means workers do not need to be on site 24/7, more work day shifts/less needed during antisocial hours.</p> <p>Supervisors' jobs can be carried out remotely.</p> | [9]  | For 3 marks, must be joined up response: 'because...', 'so that...' |
| 5 (a) (i)       | D            | <p>2 marks for each of two appropriate factors with expansion given eg:<br/>           Transport (distances and methods, weight carried) waste produced when processing.<br/>           Energy efficiency of processing small batches.</p>  | [4]  | One mark only for factor not expanded, eg energy, waste.            |

| Question Number | Syllabus Ref | Expected Answer  | Mark | Rationale                            |
|-----------------|--------------|--|------|--------------------------------------|
| 5 (a) (ii)      | D            | No marks for points repeated from part a<br>2 marks for an appropriate factor eg<br>Space requirements in current premises<br>Machinery costs/need<br>Quality available/availability<br>One mark only for factor not expanded, eg cost.  | [2]  |                                      |
| 5 (b)           | D            | Three marks for a clear explanation including for example:<br>Simplifying the manufacturing process (1) by reducing unnecessary/the number of steps(1), simplifying the product /its construction(1) or combining parts to reduce assembly steps, (1)  | [3]  |                                      |
| 6               | B            | 2 marks for clear description of a consideration related to each area (one for a single point):<br>Manufacturing processes<br>Processing times(1) avoiding over-processing Reliability/efficiency(1)<br>make to meet spec(1)cost of equipment(1)<br>Inventory<br>Reducing stock of finished goods held(1)/stores of materials and components(1) less money tied up (wasted)(1), lower storage costs(1)<br>Waiting<br>Reducing waiting time reduces the overall time made to make a product (1) time/heat and light energy are saved(1) also the quantity of work in progress (valueless) is reduced(1) money saved(1). | [6]  | Amplification needed for extra point |
| 7 (a)           | B            | <b>Symbol 1</b> ► <b>One mark for delay</b><br><br><b>Symbol 2</b> ○ <b>One mark for operation</b>   | [2]  |                                      |

| Question Number | Syllabus Ref | Expected Answer  | Mark | Rationale               |
|-----------------|--------------|--|------|-------------------------|
| 7 (b)           | B            | <p>Explain how the flow process chart above could be used in planning for lean manufacture.</p> <p>Three marks for detailed explanation:</p> <p>Flow process charts are used when analyzing the steps in a process, to help identify and eliminate waste (1). They show each step of a process in order (1) graphically(1), making it easier to see where time is being wasted(1)/identify idle time(1) examples such as the waits and times in transport taken from the chart(1)</p>  | [3]  |                         |
| *8              | E            | <p>Six marks for discussion of the impact of new technology on efficiency.</p> <p>Examples of points: <u>(specialist terms)</u></p> <p>Computer based production planning and <u>monitoring</u> enables <u>JIT</u> which ensures</p> <p>Products are <u>scheduled</u> to meet orders received</p> <p>Be finished when <u>dispatch</u> is due so stocks of finished product are not needed to meet orders</p> <p>Materials and components are delivered to <u>workstations</u> as needed for production</p> <p>This means there is no <u>waiting time</u></p> <p>So no extras are made</p> <p>Less storage space needed</p> <p><u>Automated production/monitoring</u> of production reduces <u>reject rate</u></p> <p>Identification and expansion of any of the above.</p> |      | List is not exhaustive. |

| Question Number | Syllabus Ref | Expected Answer   | Mark       | Rationale |
|-----------------|--------------|---|------------|-----------|
| *8 continued    |              | <p><b>Level 1 (0-2 marks)</b><br/>Basic discussion showing some understanding of the impact of new technology on production efficiency. There will be little, or no, use of specialist terms. Answers may be ambiguous or disorganised. Errors of spelling, punctuation and grammar may be intrusive.</p> <p><b>Level 2 (3-4 marks)</b><br/>Adequate discussion showing an understanding of the impact of new technology on production efficiency. There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, punctuation and grammar.</p> <p><b>Level 3 (5-6 marks)</b><br/>Thorough analysis, showing a clear understanding of the impact of new technology on production efficiency. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.</p> | <b>[6]</b> |           |

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